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REPORT

Wildlife and Recreation Related Workgroup

Range Economics Workshop

Tucson, Arizona

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TABLE OF CONTENTS

I. Introduction . . . . . Page 1

II. Objective . . . . . Page 1

III. Rationale/ Assumptions . . . . . Page 2

IV. Procedures for Determining Changes in Wildlife Populations Resulting from AMP Implementation . . . . . Page 3

Part I - Terrestrial Species . . . . . Page 4
Part II - Fisheries . . . . . Page 12

V. Proposed Interim Procedures for Determining Wildlife Benefits/Costs Resulting from AMP Implementation . . . . . Page

APPENDICES

1. General Criteria for Rating Big Game - AMP Value Factors . . . . . Page

2. General Criteria for Rating Fisheries - AMP Value Factors . . . . . Page

3. Determination of Wildlife Values for Use in Allotment Management Plan Benefit/Cost Analysis . . . . . Page

WILDLIFE AND RECREATION RELATED WORKGROUP

REPORT AND RECOMMENDATIONS

INTRODUCTION

This report summarizes the work of the wildlife and recreation workgroup and presents recommended methodology and procedures for interim guidance to the field for (1) estimating increases or decreases in wildlife numbers resulting from AMP implementation and (2) computing wildlife benefits and costs expected in connection with AMP implementation.

It is recognized that the placement of dollar values on wildlife and certain recreational activities is sometimes a matter of controversy. It is also recognized that the need for economic analysis relative to these resources is legitimate from budgetary, land use planning, and resource allocation standpoints. The procedures and methodology presented herein will not solve existing controversies on valuing wildlife and related recreation resources but it will serve to strengthen existing Bureau procedures and processes of arriving at these value computations.

Work group participants are as follows:

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OBJECTIVES

The workgroup objective was to strengthen Bureau procedures for indicating wildlife related benefits resulting from implementation of AMP's.

The basic strategy for achieving this objective involved:

1. Development of procedures for determining wildlife population changes resulting from AMP implementation since changes in animal numbers are one of the primary inputs into benefit-cost (b/c) calculations,

2. Revision of existing procedures for computing wildlife benefits and cost associated with AMP implementation.

3. Developing recommended interim guidance and procedures that will (a) modernize existing wildlife B/C calculation procedures outlined in Instruction Memorandum 76-455, (b) minimize the need for "estimates" and "guesswork" in determining animal population changes in connection with wildlife value determinations and b/c analysis and (c) provide systematic, uniform procedures for arriving at economic related wildlife inputs into AMP b/c calculations.

RATIONALE AND ASSUMPTIONS

The following rationale and assumptions were established by the workgroup to guide efforts in achieving the objective set forth above.

1. Consumptive versus Nonconsumptive Orientation of Workgroup Efforts

   In evaluating the B/C analysis procedures for wildlife and recreation use, we keyed on consumptive use rather than nonconsumptive use because:

   a. Available data and research gives some direction on valuation of consumptive wildlife uses.

   b. A direct relationship can generally be shown between increase in wildlife populations and increase in consumptive uses.

c. Non-consumptive uses are more intangible and basic data is usually non-existant. In general, implementation of AMP's has a lesser impact on the non-consumptive uses and there is almost no effect of AMP's on non-consumptive uses not involving wildlife (sightseeing, rockhounding, etc.).

We feel development of a procedure for evaluation of consumption use can later be adapted for measuring values of non-consumptive uses.

2. Habitat Value Considerations

No attempt has been made to place a "value" on wildlife habitat. This is because the work group concentrated on determining the value of changes in hunter days. The habitat has value because it is necessary to support wildlife. The habitat value can be derived from the demand for the species which occupies it. By concentrating on hunter days, we did bypass the determination of habitat values directly. We used this approach because there are better data on hunter days and it is easier to define the values measured. Our basic assumption is that the value of the habitat can be reflected in the value of hunter days, to a large extent.

3. Threatened and Endangered Species in Benefit/Cost Analysis

Protection of threatened and endangered species is a legislative mandate with unquantifiable social benefits that fits better into cost effectiveness analyses rather than benefit/cost analyses. Thus, we must seek the least cost approach for fulfilling the endangered species mandate for protection of listed species and their critical habitat.

PROCEDURES FOR DETERMINING WILDLIFE VALUES RESULTING FROM AMP IMPLEMENTATION

Implementation of allotment management plan (AMP) grazing systems and development actions has a definite impact on wildlife habitat and populations. Impacts can be either negative or positive depending on the wildlife species involved, condition of habitat, and, more importantly, the amount of range-wildlife input and coordination that goes into each AMP.

A major difficulty lies in trying to quantitatively define the negative or positive wildlife effects that result from AMP implementation. Generally, a completely subjective approach is used, wherein wildlife or range staff specialists appraise each AMP and estimate the degree that a particular grazing system and/or developments will result in an increase or decrease of priority wildlife species (elk, deer, trout, sage grouse, riparian birds, etc).

The exercising of professional judgment is, and must remain, a part of the process. However, a systematic procedure is needed to produce a better quantitative product and to minimize the need for educated guesses in determining wildlife impacts resulting from AMP implementation. It is for this reason that the procedure below has been prepared.

PART I - Terrestrial Species

Procedure

This proposed interim procedure for determining AMP wildlife values includes (1) determination of present and future populations of wildlife on the AMP area and (2) arriving at ratings for three major elements as follows:

1. Habitat condition of the allotment
2. Relative importance of individual allotment habitat/range to the total habitat/range for wildlife; and
3. Probable impacts of grazing systems and developments on wildlife

Rating values and data for these three elements can then be applied using mathematical procedures to calculate the positive or negative wildlife values resulting from AMP implementation.

The following is a discussion of the procedures for arriving at population changes and for each of the three rating elements.

Determination of Present/Future Populations of Wildlife

In some states, such as Colorado and Wyoming, the current population of game animals (deer, elk, antelope, etc.) is provided by the state wildlife agencies, e.g., Colorado Division of Wildlife (DOW) and Wyoming Game and Fish Department. These two state wildlife agencies, as part of their long-range "Strategic Plans", have also

projected their objectives for game populations for five to ten years. 1/ These population estimates and related habitat factors are assumed to have been obtained from field inventories and subsequently incorporated within the Bureau planning system during the URA and MFP process. The wildlife population targets resulting from MFP decisions are then presented within the AMP in terms of animals per square mile of seasonal habitats or in other appropriate terms.

The population projections can then be considered as the optimum numbers of animals to be obtained for any one given AMP area and, considering seasonal use restrictions, maximum numbers for which BLM habitat management efforts could be targeted. Thus, the current and projected populations of animals within an allotment can then be calculated as follows:

Square miles of suitable AMP habitat for the species of concern X present number of animals/square mile = present AMP population. (A)

Square miles of suitable AMP habitat X future number of animals/ square miles = future AMP populations. (B)

Future AMP population - present AMP population = optimum increase within the allotment. (C)

Optimum future population X, the season or time of use by the animals on AMP habitat factor = maximum population affected by AMP.

The maximum population of a species (D) that could be affected by AMP implementation is calculated by multiplying the optimum population of animals by the percentage of the year that the animals are on the allotment. This will vary by species and geographic region. In Colorado, for example, the following generally applies:

Antelope and year-long use for other big game species = 12/12 factor
Mule deer/elk - winter range = 5/12 factor
Mule deer/elk - summer range = 7/12 factor

Example: The Johnson Mesa allotment on mule deer winter range contains 10 square miles of suitable habitat (substract unsuitable livestock range from total AMP acreage since the AMP

1/ Other state wildlife agencies have similar methods for population estimates. It is of utmost importance to remember that any population figures used are estimates only, based on professional judgment and current state-of-the-art technology. Some state wildlife agencies are now using computer modeling approaches to derive population numbers.

will not affect unsuitable range regardless if wildlife use it or not). The present winter population is 15 deer/sq. mile. The projected winter population is 22.5 deer/sq. mile.

A. Present AMP populations = 15 deer/sq. mile x 10 sq. miles = 150 deer.

B. Future AMP population = 22.5 deer/sq. mile x 10 sq. miles = 225 deer.

C. 225 deer - 150 deer = 75 deer optimum increase within this allotment.

D. 75 deer x 5/12 winter range = 31 deer maximum in area within the allotment as constrained by the fact that the allotment area is winter range.

Once the maximum possible population has been determined, it is then necessary to calculate what portion of the increase or decrease in animal numbers can be attributed to AMP implementation. Very seldom, if ever, would 100 percent of a population increase or decrease be attributed solely to an AMP. Natural population trends, adjacent private land impacts, etc., will also be involved. This procedure involves two major professional judgment steps:

First, it must be determined whether implementation of a particular AMP is positive, negative, or neutral for wildlife. This is purely a professional judgment by the wildlife biologist and range specialist involved. For each species involved, implementing the AMP (including grazing treatments and range development) will result in an increase (positive), decrease (negative), or no change (neutral) in population levels. Generally, custodial type AMPs or those involving no change in grazing systems or developments result in a "no change" or neutral situation.

Second, if an AMP has been professionally judged to have a positive or negative impact on populations, the degree or percentage of this change which can be attributed to the AMP can be determined by calculating numerical ratings for each of three elements and appropriate rating factors.

Element	No. Rating Factors Within Each Element	Rating Range	Total Rating Points
1. Habitat Condition	4	1-10	40
2. Relative importance of AMP habitat/range to total habitat/range of the species	5	1-10	50
3. Probable impacts of grazing System and AMP developments	7	1-10	70
			160

In the discussion which follows, it is assumed in the examples given that AMP implementation will have a positive or increasing impact. Calculating a negative or decreasing impact would be done the same, except a (-) value would be shown for rating numbers. Weighting of factors within each element (giving more importance to some factors over others) may be appropriate, depending on existing field conditions. This could best be determined by BLM and state wildlife agency discussions.

Element 1. Habitat Condition of The Allotment 1/

Four factors are involved in rating the habitat condition element of the allotment:

	Rating Range
1) Water	1-10
2) Food	1-10
3) Animal Cover	1-10
4) Habitat Importance of the AMP Area to its Existing Population	1-10
Maximum total possible	40

In determining habitat condition, the biologist and range specialist review existing inventory, URA and AMP data and professionally judge the sum total impact of AMP implementation on these four factors. 2/ The end result will be to produce an average rating between 1-10 that AMP implementation would generate. The higher the number, the greater the impact.

Example: Johnson Mesa allotment for mule deer on winter range:

1.	Water rating =	6
2.	Food rating =	4
3.	Animal cover rating =	4
4.	Habitat importance rating =	2
	Total =	16 out of 40 maximim points

1/ See appendix 1 for general criteria for rating big game - AMP value factors.

2/ The criteria to establish the point value for each factor within each element (condition, importance, impacts) could be developed using habitat requirements developed by Bureau and State Agency personnel within respective states for seasonal use areas by species, with DSC assistance.

Average AMP implementation rating considering habitat condition = 16 ÷ 4 (factors) = 4 (on a scale of 1-10).

Element 2. Relative Importance of Individual Allotment Habitat/Range To The Total Habitat/Range Used by the Species

Determining the relative importance rating involves looking at the individual AMP habitat or range compared to the total habitat or range available for a species, e.g., deer winter range within an allotment relative to the entire deer herd's winter range. Factors considered in this determination and their ratings are:

	Rating Range
1) Season of use	1-10
2) Concentration Area Use	1-10
3) Vegetation, limiting factor (includes food and cover)	1-10
4) Percentage of Population Dependent on AMP area	1-10
5) Physical/Geographic Availability for Animal Use	1-10
Maximum Total Possible	50

Example: Johnson Mesa Allotment for mule deer on winter range.

1. Season of use rating =	2
2. Concentrattion area use rating =	6
3. Vegetation limiting factor rating =	8
4. Percent of AMP population rating =	4
5. Physical/geographic avail. rating =	10
Total =	30 out of 50 maximum

Average AMP implementation rating considering relative importance of the AMP habitat = 30 ÷ 5 (factors) = 6 (on a scale of 1-10).

Element 3. Probable Impacts of AMP Grazing System and Developments on Wildlife

Determining the rating for the probable impacts of AMP grazing systems and developments on wildlife is of greatest importance and has a multiplying mathematical effect. It contains seven factors to be rated:

	Rating Range
1) Potential for vegetative improvement	1-10
2) Types of vegetation to benefit from grazing system	1-10
3) Current livestock grazing system in relation to key forage species	1-10
4) Proposed livestock grazing system via AMP objectives	1-10
5) Effects of AMP developments on wildlife habitat	1-10
6) Effects of grazing system and developments on special wildlife use areas, e.g., elk calving areas, antelope kidding grounds, sage grouse strutting grounds, etc.	1-10
7) Degree of change from past grazing practices to the future	1-10
Maximum total possible	70

Example: Johnson Mesa allotment for mule deer on winter range.

1. Vegetative potential improvement rating	3
2. Vegetative type benefit rating =	4
3. Current livestock grazing system rating =	2
4. Proposed livestock grazing system rating =	5
5. Effects of AMP development rating =	4
6. Grazing system effects on special use areas rating =	5
7. Degree of change from past grazing to the future =	7
	35 out of 70 maximum

Average AMP implementation rating considering grazing systems and developments = 35 ÷ 7 (factors) = 5 (on a scale of 1-10).

Computing Overall Quantifiable Wildlife Values Resulting from AMP Implementation

To calclulate an AMP's overall positive (increasing or benefit) or negative (decreasing or cost) impacts on wildlife values, it is necessary to mathematically combine the maximum possible wildlife population figure with the AMP's three element rating values as set forth below.

The Johnson Mesa allotment and mule deer herd winter range is, again used as an example:

1. The maximum total population of mule deer that could be increased in the allotment, considering it is used as a winter range, equals:

   Future population - present population x winter range factor
   Thus, 225 deer - 150 deer = 75 deer x 5/12 = 31 deer or [E]

2. The average rating of the AMP's three major elements factors equals:

   Total of elements factor rating ÷ No. factors = average rating
   Element 1: 16 ÷ 4 = 4 or A
   Element 2: 30 ÷ 5 = 6 or B
   Element 3: 35 ÷ 7 = 5 or C

3. The percentage of the maximum future deer population that could be attributable to AMP implementation equals:

   (Average rating of factors in element 1 + Average rating of factors in element 2) X (Average rating of factors in element 3) divided by (Total rating of any one factor in element 1 + total total rating of any one factor in element 2) X (Total rating of any one factor in element 3) or:

   [(A + B) X C] ÷ [(10 + 10) X 10] X 100, or
   [(4 + 6) x 5] - [(10 + 10) x 10] x 100, =
   [(10 x 5) - (20 x 10)] x 100
   (50 - 200) x 100 = 25% or D

4. The number of Johnson Mesa mule deer that could be increased within the Johnson Mesa allotment by AMP implementation equals:

   Maximim No. deer (E) times percentage attributable due to AMP implementation (D), or

   E x D = Number of animals (F), or 31 deer x 25% = 7.75 deer. (This should be rounded to 8 deer).

5. The dollar amount of benefits attributable annually to the Johnson Mesa mule deer herd (H) through implementation of the Johnson Mesa AMP equals the number of deer increase (F) times the dollar value of a deer hunting user day (W) times the days required to harvest one deer (DH) times the percentage of the deer population harvested in one year (HR).

H = F x W x DH x HR
Thus, by substituting values for these variables

H = 8 x $42 x 11 x .25 Therefore:

H = $924

6. The $924 annual benefit over the fifty-year analysis period, given an appropriate period of time for the deer herd when buildup, is then discounted to the present or base year for the analysis using the appropriate discount rate and buildup factor. For example: Given discount rate of 6 5/8%, the present value of the Johnson Mesa mule deer benefit is $8,962.80 ($924 x 9.20 = $8,962.80).

A synopsis of the procedures involved in determining terrestrial wildlife values resulting from AMP implementation is as follows:

1. Determine maximum wildlife population that could be increased or decreased in the allotment areas. (E)

2. Determine whether the AMP implementation has a positive or negative effect. (+) or (-)

3. Calculate the average rating of the allotment's habitat condition (4 factors) (A)

4. Calculate the average rating of the allotment's specific habitat/range importance for a species to its total habitat/range (5 factors) (B)

5. Calculate the average rating for the AMP's probable grazing system and development impacts on wildlife (7 factors) (C)

6. Calculate the AMP's overall positive or negative percentage impact on wildlife values resulting from implementation. (D), or (A + B) x C = D

7. Calculate the number of animals that could be increased or decreased by AMP implementation (F) by multiplying E x D.

8. Calculate the annual dollar value of benefits or costs (H) resulting ffom wildlife population changes to use for input in the B/C analysis.

H = F x W x DH x HR

where:

F = Animal population increase in numbers
W = Dollar value of a user day
DH = Days required to harvest one animal
HR = Percentage of annual population harvested in one year

From H, calculate the present value of the wildlife benefits or costs (PV) by applying the appropriate buildup factor.

PV = H x appropriate buildup factor

PART II - Fisheries

The determination of relative change in fisheries values from implementation of an AMP is very similar to that used for wildlife. The factors used to rate condition, importance, and impact on the habitat are different than those used for terrestrial wildlife in that the terminology relates to streams and riparain vegetation only.

Appendix 2 sets forth criteria for rating the quality of stream habitat for fish relative to rating elements 1 and 3 set forth below. Since the rating factors under element 2 deal with the species being analyzed, it is necessary to acquire specific biological information from appropriate scientific sources in that geographical area or region.

Element 1. Stream Habitat Condition of the Allotment

Six factors are involved in rating the habitat condition element of the allotments:

	Rating Range
1) Stream Flow and Water Quality	1-10
2) Riffle/Pool ratio	1-10
3) Stream temperature	1-10
4) Channel and bank stability	1-10
5) Riparian vegetation structure	1-10
6) Spawning area quality	1-10

Element 2. Relative Importance of Individual Allotment Habitat/Range to the Total Stream Habitat/Range Used by the Species

Determining the relative importance rating involves looking at the individual stream habitat in miles or acres compared to the total stream habitat available for a species (e.g., cutthroat trout habitat within an allotment relative to the entire cutthroat population in the basin or sub-basin). Care must be taken to relate these important factors to the basin of the AMP or the immediate region of influence. Factors considered in this determination and their ratings are:

	Rating Range
1) Resident species dependence	1-10
2) Migratory species dependence	1-10
3) Food production	1-10
4) Spawning	1-10
5) Rearing	1-10
6) Water production and quality	1-10

Element 3. Probable Impacts of AMP Grazing System and Development on Wildlife

Determining the rating for the probable impacts of AMP grazing systems and developments on aquatic life is of great importance and has a multiplying mathematical effect. It contains 6 factors to be rated which are the same as those rated in element 1, Stream Habitat Conditon of the Allotment.

Determining Fisheries Values Resulting From AMP Implementation - An Example

Present Situation

Johnson Creek begins flowing in the Johnson Mesa AMP area. The Creek has a populationof brown trout that is limited by habitat conditions. The grazing of cattle has resulted in the loss of riparian vegetation. This has caused stream temperatures to warm, banks to erode, gravel beds to silt-in and cover for fish to be lost. The riffle/pool ratio is less than favorable (80/20) due to a loss in stream channel structure where banks have collapsed and pools have silted-in. Stream riparian structure is less than 50 percent, bank stability is 40 percent, stream flow is a constant 5 cfs. with no water withdrawals presently taking place. Stream temperatures frequently reach the 80 degrees F. range during summer afternoons. Approximately 2 miles of stream out of a 5-mile total habitat basin is involved. It has been found that 2 miles are the main spawning area in the entire 5-mile segment.

Proposed Changes with AMP

The stream in the riaprian zone will be fenced to prevent cattle access except at watering points located every one-half mile. The stream flow will be slightly (5 percent) reduced by a proposed irrigation scheme to provide better grazing for cattle away from the stream. Several water developments will be supplied by stream water but these constitute an insignificant proportion of the amount in the stream. The protection of the stream will be expected to allow regeneration of reparian vegetation banks to stabilize riffle/pool recovery, and eventual temperature declines. This portion of the stream is the upper 2 miles of the 5-mile segment and is spring fed from a hillside that will be enclosed in the fence proposal. It is projected that spawning success will increase as sediment decreases. This upper two-mile segment is the major brown trout spawning segment in the whole 5-mile stretch of stream. The downstream three miles outside this segment is used principally for rearing and feeding by larger fish that have been hatched in the upper 2 mile segment within the AMP.

Thus, the process for computation of fisheries values for Johnson Mesa Allotment is as follows:

Element 1. Habitat Condition of the Allotment

	Rating Range
1) Stream flow and Water quality	10
2) Riffle/pool ratio	2
3) Stream temperature	2
4) Channel and bank stability	4
5) Riparian vegetation structure	4
6) Spawning area quality	2
	24 ÷ 6 = 4 Wted. Avg.

Element 2.. Relative Importance of Individual Allotment Habitat/Range to the Total Stream Habitat/Range Used by Brown Trout

	Rating Range
1) Resident species dependence	6
2) Migratory species dependence	8
3) Food production	4
4) Spawning	10
5) Rearing	4
6) Water production and quality	10
	42 ÷ 5 = 8.4 Wted. Avg.

Element 3. Probable Impacts of AMP Grazing System and Developments on Wildlife

	Rating Range
1) Stream flow and Water Quality	10
2) Riffle/pool ratio	8
3) Stream temperature	8
4) Channel and bank stability	8
5) Riparian vegetation structure	10
6) Spawning area quality	8
	52 ÷ 6 = 8.7 Wted. Avg.

AMP impact on fisheries values =

$$\frac{\text{(Actual Habitat Condition Rating + Actual Relative Importance)}}{\text{(Possible habitat condition maximum + Possible Realtive Importance Max.)}}$$

X

$$\frac{\text{(Actual Impact of Grazing System Analysis and Development Rating)}}{\text{(Possible Impact of Grazing System Analysis and Development Rating)}}$$

X 100

A. Habitat condition rating - 4 (out of a possible 10)
B. Relative importance rating = 8.4 (out of a possible 10)
C. Impacts of grazing system analysis and development rating = 8.7 (out of a possible 10)

Therefore, in this example:

$$\text{AMP impact on fisheries values} = \frac{(4 + 8.4)}{(10 + 10)} \times \frac{8.7}{10} \times 100 = 54 \text{ percent}$$

According to the state of wildlife agency, the maximum future population that can be expected under best stream conditions is 400 catchable fish per mile. The present population is now estimated to be 50 catchable fish per mile.

Therefore:

Future population - present population = Maximum possible increase within the allotment.

400 fish/mile X 5 miles of stream - 50 fish/mile X 5 miles of stream = Maximum possible increase within allotment.

Therefore:

2000 fish - 250 fish = 1750 maximum possible increase within allotment

Maximum possible increase within allotment X % increase from AMP impact = Net Fish Population Increase Attributed to the AMP

1750 maximum possible X 54% = 945 net fish population increase attributed to the AMP

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Procedures for Computing Wildlife Related Benefits and Costs Resulting From AMP Implementation

Recommended interim procedures for computing wildlife benefits and costs are described in Appendix 3. We propose that the short term standardized equations defined therein be implemented as interim procedures for determining wildlife benefits and cost associated with AMP implementation.

APPENDIX

Appendix 1 - General Criteria for Rating Big Game AMP Value Factors 1/

This Appendix provides interim criteria for rating the various factors in each of the three rating elements set forth in section IV, Part 1 of the work group report. More detailed, specific criteria must be developed under leadership of DSC and in conjunction with State/District office personnel. Since the criteria listed below are only broadly applicable, specific criteria must be developed for the various categories of wildlife.

Element 1 Habitat Condition of the Allotment (Total maximum 40 points)

Factor	Rating	Criteria
Water: (Maximum total 10 points)	8-10	Permanent water available within 3 mile radius
	5-7	Permanent water available somewhere in allotment
	1-4	Water available on intermittent basis
	0	No water or water in poor quality
Food: (Maximum total 10 points)	6-10	Key shrub, grass and forb species physically available and in good interspersion; key forage vegetation composition at least 75% trend on key plants up
	2-5	Key forage species present; physical availability limitations exist; plants scattered; key forage plant composition at least 50% trend on key plants stable.
	0-1	Key forage plants absent or few in number, interspersion lacking; vegetation composition below 50%; trend on key plants decreasing.
Animal Cover: (Maximum point 10 points)	8-10	Tree and shrub density and height sufficient to conceal an adult animal within 200 yard sight distance; cover adequate to eliminate wind chill factor to a point where body metabolism can keep in advance of caloric food intake; cover open area distance less than 1/4 mile apart.
	3-7	Tree and shrub density and/or height conceals an adult animal within 40 yard sight distance; wind chill factor such that forage caloric intake equals body metabolic rate; cover patch - open area distance 1/2 - 1/4 mile apart.

1/ Prepared by Ed Roberts and George Hollis in collaboration with Dick Kerr

	0-2	Tree and shrub density and/or height does not conceal an adult animal or does so only part-time; reliance for cover greatly on topography; wind chill factor such that forage caloric intake cannot keep up body metabolic rate; cover patch - open area distance greater than 1/2 mile apart.
AMP Habitat - Importance to Existing Population	8-10	Habitat provides food, cover, water and living space in total for animals, 80-100% of the time that animals are present.
	4-7	Habitat provides food, cover, water and living space in some combination, 40-20% of the time that animals are present.
	0-3	Habitat provides food or cover or water or living space, 5-40% of the time that animals are present.

Element 2 Relative Importance of Individual Allotment Habitat to the Total Habitat Used by the Species (Total maximum 50 points)

Factor	Rating	Criteria
Season of Use:	8-10	Used as crucial winter or summer range each year during extreme weather conditions.
	4-7	Used as "normal" winter or summer range each year during average weather conditions.
	0-3	Provides peripheral winter or summer range either annually or sporadically, weather conditions have little or no influence on use.
Important Use Area:	8-10	Supplies adequate habitat for breeding, young-rearing, and population recruitment over 75% of the area.
	4-7	Supplies adequate habitat for breeding, young-rearing, and population recruitment over 25-75% of the area.
	0-3	Supplies adequate habitat for breeding and/or young-rearing, and/or population recruitment, any one of which offers over less than 25% of the area.

Vegetation Limiting for Food and Cover:	8-10	Combination of trees, shrubs, grasses and forbs abundant and in good interspersion such that food and cover uses are not limited; population levels will increase.
	4-7	Vegetation limits food and cover uses to 90 days per year; animal populations can increase.
	0-3	Vegetation limits food and cover uses to less than 30 days per year and will only permit minimum population survival.
Percentage of Population Dependent on AMP Area:	8-10	50-100% of herd population dependent on area for food, cover, water or living space.
	4-7	20-50% of herd population dependent on area for food, cover, water or living space.
	0-3	Less than 20% of herd population dependent on area for food, cover, water of living space.
Physical/Geographic Availability for Animal Use:	8-10	Animals can gain easy access to habitat over 80% of the area with no significant physical or geographic barriers.
	4-7	Animals can gain access to habitat over 40-80% of the area, with extra physical effort required to negotiate at least one significant barrier (cliff, canyon, river, etc.)
	0-3	Animals can gain access to habitat over 10-40% of the area, with considerable physical effort required to negotiate more than one significant barrier.

Element 3. Probable Impacts of AMP Grazing System and Developments on Wildlife (Total maximum 70 points)

Factor	Rating	Criteria
Potential for Vegetative Improvement:	8-10	Vegetation composition and trend in poor condition with at least a 75% potential for improving key plants for food and/or cover use.

Factor	Rating	Criteria
	4-7	Vegetation composition and trend in fair to good condition with a 25-75% potential for improving key plants for food and/or cover use.
	0-3	Vegetation composition and trend in good to excellent condition with a maximum potential of 25% for improving key plants for food and/or cover use.
Types of Vegetation to Benefit from Grazing System:	8-10	Key browse, forb and grass species will all benefit from grazing, increasing vigor and trend by at least 30%.
	4-7	Either/or key browse, forb and grass species will benefit from grazing, increasing vigor and trend between 15-30%.
	0-3	Only one of the key browse, forb or grass plant groups will benefit from grazing, increasing vigor and trend between 5-15%.
Current livestock Grazing System in Relation to Key Forage species:	8-10	Key forage plants showing good-excellent condition for age, form class, availability, use and vigor over at least 75% of the area.
	4-7	Key forage plants showing fair-good condition for age, form class, availability, use and vigor over 40-75% of the area.
	0-3	Key forage plants showing poor-fair condition for age, form class, availability, use and vigor over 50% of the area.
Proposed livestock grazing system use AMP objectives:	8-10	Food, cover and water availability, quantity and quality improved over 75% of the area; forage competition less than 20%; forage available in sufficient quantities during all critical seasons of use.

Factor	Rating	Criteria
	4-7	Food, cover and water availability, quantity and quality improved or maintained over 50% of the area; forage competition 20-50%; forage available only partially during all critical seasons of use.
	0-3	Food, cover and water availability or quantity or quality only maintained; forage competition greater than 50%; forage limited during any or all critical seasons of use.
Effects of Grazing System and Develop. on Special Wildlife Use Areas:	8-10	Breeding, young-rearing and recruitment areas remain undisturbed or improved over 75% of the area.
	4-7	Breeding, young-rearing and recruitment areas remain undisturbed, but not necessarily improved, over 40-75% of the area.
	0-3	Breeding, young-rearing and recruitment areas are disturbed, but not over 30% of the area.
Degree of Change from past grazing practices to the future:	8-10	Change eliminates or reduces seasonal use and forage consumption conflicts from 75-100%.
	4-7	Change reduces seasonal use and forage consumption conflicts from 40-75%.
	0-3	Change maintains conflicts or reduces seasonal use and forage consumption conflicts a maximum of 25%.

Appendix 2 - General Criteria for Rating Fisheries - AMP

Value Factors 1/

The following criteria are normally applied by biologists to streams being assessed for their habitat capability to support coldwater game fish. Other criteria can be developed for other categories of fish.

Elements 1 and 3. (See section IV, Part II of the Workgroup Report)

Rating Factor

Rating of 9.5 - 10 (Excellent)	1. Stream Flow and Water quality	Natural condition with continuous flow (no withdrawals)
	2. Riffle and pool ratio	40/60 - 50/40
	3. Stream temperature	Less than 68 degrees F.
	4. Channel & bank stability	95-100% of natural stability
	5. Riparian vegetation structure	95-100% of full growth
	6. Spawning gravel availability	Adequate amount to spawn normal population annually
Rating of 7.5 - 9.5 (Good)	1. Stream flow and water quality	Continuous flow with quality capable of sustaining fish populations at high levels
	2. Riffle and pool ratio	30/70 - 70/30
	3. Stream temperature	Temperature not exceeding 68 degrees F for more (±) 10 days/year
	4. Channel & bank stability	75-94% of natural stability
	5. Riparian vegetation structure	75-94% of full growth
	6. Spawning gravel availability	Adequate amount to spawn normal population annually
Rating of 5 - 7.4 (Fair)	1. Stream flow and water quality	Flow and quality capable of maintaining a viable if not abundant fish population
	2. Riffle and pool ratio	20/80 - 80/20
	3. Stream temperature	Temp. not exceeidng 68 degrees for more than (±) 20 days
	4. Channel & bank stability	50-74% of natural stability
	5. Riparian vegetation structure	50-74% of full growth
	6. Spawning gravel availability	Enough gravel available to sustain population at present leve
Rating of 1 - 4 (Poor)	1. Stream flow and water	Flow and quality may be insufficient at times to maintain viable population levels.
	2. Riffle and pool ratio	Outside the 20/80 - 80/20 range
	3. Stream Temperature	Temp. exceeding 68 degrees F fo more than 20 days per year.

1/ Prepared by John Anderson

(Continued)

Rating of 1 - 4 (Poor)	4. Channel & bank stability . . .	Less than 50% of natural stability
	5. Riparian vegetation structure .	Less than 50%
	6. Spawning gravel availability .	Gravel may be insufficient to sustain a viable population

Explanation of Key Fisheries Habitat Criteria

The following explanation is made in order to establish a frame of reference when individuals are considering each of the key criteria, from both a present and future level standpoint.

1. Stream Flow and Water Quality

The need for a continuously flowing stream is generally considered a necessity for most fish species. As flows decrease and/or pollutants are added to change the natural condition, the population declinesdue to a loss of habitat quality. Decline in population may not be linear in that a population crash can occur when a critical level of habitat deterioration is reached. Studies and experience with each fish species dictates the effect of stream flows. These levels can be refined by biologists for their area and for the species of concern based on local studies or other documentable data. When a stream is flowing in a natural condition at original levels with no pollutants being added (e.g., excessive sediment, mining waste etc.), the condition will normally be considered "excellent" or "best possible" for that stream. Flow in different basins can be expected to vary throughout a region. The natural condition of the stream in question or its basin should be the bench mark of comparability.

2. Riffle/Pool Ratio

Most fish species have been found to flourish and produce peak population when riffle/pool ratios are near 50% riffle and 50% pool. As this ratio is shifted toward the ends of the scale (e.g., 20/80 or 80/20) population levels are reduced. The riffle/pool ratios are influenced by stream degradation which causes pools to silt in or channels to scour. The riffle/ pool ratio is a primary measure of a stream's production capability and stability, in most cases.

3. Stream Temperature

A critical factor in the life cycle of any fish species is temperature. Studies have been conducted for nearly every major fish species temperature requirements. As temperature changes from optimum, the capability of the habitat to produce fish declines.

The fine tuning of temperature requirements for each species can be adjusted by the local biologist for his area with a great degree of accuracy due to the wealth of scientific studies concerning this parameter.

4. Channel and Bank Stability

The relative natural condition of a stream is not static. It is dynamic. However, there is a great deal of stability within this dynamic environment. The natural condition in an unaltered state should be examined if it still exists. This will provide a baseline of full stream production. However, much of the western stream environment has been altered and it is often necessary to rely on research papers for this description of the standard to be attained. As the channel and banks erode due to the unstabilizing effects of man's activities, the overall stream ability to produce fish declines. There is a close correlation between this parameter and the riffle pool ratio.

5. Riparian Vegetation Structure

The riparian vegetation along a stream in a natural undisturbed condition is the standard of "best condition". Vegetation binds the stream banks together, shades the stream, provides overhanging cover, provides allocthanous inputs for energy conversion by aquatic organisms etc. Usually the vegetation along a stream is examined for its ability to provide shade. This may or may not be valid due to the fact that some streams are too wide for the vegetation to shade a significant portion of the stream surface. It is therefore important to examine the vegetation for its relationship to the best possible natural condition that could be attained. When vegetation along streams declines from a mature state, there is a direct effect on channel stability. Stream banks collapse, cover is lost and loss on nutrient inputs are just a few of the effects of this decline. The relationship to fish populations is often direct. Therefore, as in the case of the other key habitat criteria, the riparian vegetation structure directly influences the ability to produce fish.

Refinement of the effects of the riparian vegetation on fish populations are presently being studied and documented. Local or regional studies may be available through wildlife agencies and universities. These can be used to "fine tune" the rating criteria to species and stream basins being considered.

6. Spawning Gravel Availability

In the case of spawning, needs of fish species are variable. Studies of these requirements are readily available and can be used

to determine the "best possible" against which a rating of present condition can be compared. As the spawning capability declines so should the population of fish and therefore the habitat quality rating. It is quite possible some species of fish may not require gravel and if these species are being considered, the biologist should simply adjust the rating to reflect what scientific studies indicate as best possible spawning requirements for that fish. The quality of spawning success should be recognized as critical to the continuation of the species and addressed as a key criteria. In some areas spawning may not be critical if the area of consideration is outside the spawning area.

Appendix 3

Determination of Wildlife Values for Use in Allotment Management Plan Benefit-Cost Analysis

Statement of Problem

Instruction Memorandum (IM) No. 76-455 was issued August 26, 1976, setting forth procedures for AMP economic analysis. These procedures were adopted by the Bureau and became a mandatory requirement for use by all field offices to conduct economic analysis as part of AMP preparation prior to starting grazing environmental statements (ES).

Economic analysis requirements are now and will be in force in the future regardless of the grazing statement strategy under which the AMP's originate (Short-Term - Interim - Long-Term). Whether the AMP's are written before or after the ES does not alter the need for, nor the scope of the analysis required.

When IM No. 76-455 was issued, the Department of the Interior enclosed a standardized list of wildlife values for the States (enclosure 5) and required that these values be used on an interim basis to continue until such time as studies underway in the Department were completed. The intent was that the results of these studies would then be reviewed for possible adoption by BLM. The studies were expected to be completed within one to two years from the data IM No. 76-455 was issued, but have been considerably delayed with an exact completion time uncertain.

It is necessary for BLM to develop a procedure for valuing wildlife to replace the standardized list of values in IM 76-455, enclosure 5.

It is recognized that placing dollar values on wildlife has been and will continue to be a subject of considerable controversy. However, since

Appendix 3

Determination of wildlife Values for Use in Allotment Management Plan Benefit-Cost Analysis

Statement of Problem

Instruction Memorandum (IM) No. 76-435 was issued August 26, 1976, setting forth procedures for BLM economic analysis. These procedures were adopted by the Bureau and became a mandatory requirement for use by all field offices to conduct economic analysis as part of NEPA preparation prior to enacting grazing environmental statements (EIS).

Economic analysis requirements are now and will be in force in the future regardless of the grazing settlement strategy under which the EIS's originate (Short-Term - Interim - Long-Term). Whether the EIS's are written before or after the IM is done not alter the need for, nor the scope of the analysis required.

When IM No. 76-435 was issued, the Department of the Interior produced a standardized list of wildlife values for the States (principally) and required that these values be used on an interim basis to continue until such time as studies underway in the Department were completed. The interim was that the results of these studies would then be involved for possible adoption by BLM. The studies were supported to be completed within one to two years from the date of IM. 76-435 was issued, but have been considerably delayed with no exact completion time presently.

It is necessary for BLM to develop a procedure for valuing wildlife to replace the standardized interim values in IM 76-435, enclosure 2.

It is recognized that grazing policy values on wildlife has been and will continue to be a matter of considerable controversy. However, since

we must determine human-use-related dollar values for inclusion in our economic analysis process, it is important that we develop a procedure which is focused on those wildlife species most directly and observably affected by BLM livestock grazing investments. Also, we must stick to valuing procedures which focus on most easily and readily determinable dollar values.

Therefore, the valuing procedures outlined here focus on sportsmen-related wildlife use, which will give a base dollar value for wildlife which can safely be included in the benefit/cost equations. It is recognized that this base dollar value may not include all the value associated with wildlife. It is expected that future studies and analysis will add information to help determine any additional value beyond this base. These procedures do not preclude the inclusion of dollar values for wildlife watching or existence value, etc., should they be determined based on sound national efficiency type methodology, such as the type we are setting forth in this document for sportsmen-related wildlife use.

Since circumstances differ between states with respect to data available and application of data to a particular set of conditions, a certain degree of flexibility is desired for an acceptable framework within which states can operate to value wildlife-related benefits (or costs). This framework must be within the bounds of acceptable economic analysis methodology required for the expenditure of Federal funds, while still allowing states to use the best "tools" available to them.

A state may approach the problem of valuing wildlife-related benefits (or costs) by placing a value on use days, wildlife species production, or

habitat, whichever is considered most appropriate for the individual situation (for example, spawning habitat for salmon could be valued for inclusion in the benefit/cost analysis, since sportsmen use is far removed from the AMP's proximity). It is suggested that valuing habitat is preferable where possible and valuing wildlife species is preferable over the user/day approach.

Successful use of any of these approaches states to have a methodology designed to predict changes in wildlife population which result from range investments. The methodology (enclosure 1)[1/] is an example of what is necessary.

Benefit/Cost Values Defined

State Offices must view wildlife-related economic analysis from two different perspectives.

First, efficiency analysis for the expenditure of federal public funds. This involves benefit/cost analysis and focuses on contributions of a particular investment to National Economic Development, as observed in changes in the value of goods and services provided. This type of analysis takes a much narrower view than does the second type - Regional Impact Analysis, which considers the direct and indirect impacts. These types of impacts are not usually included in national efficiency benefit/cost analysis since they are usually netted out by changes which result in other regions.

Therefore, the wildlife valuing methods adopted by the BLM must take a much narrower view of value than the typical Regional Impact approach.

In order to allow enough flexibility for states to choose a wildlife valuing approach which will best suit their individual circumstances and

1/ Enclosure 1 would consist of section IV, Parts 1 and 2, plus appendicies

needs, the four following choices are available. They are: 1) the access fee appraoch; 2) willingness-to-pay survey method; 3) the travel cost method; 4) standardized equation approach.

It is recognized that time must be provided for states to adopt the appropriate method(s) and conduct the necessary studies and analyses consistent within their Annual Work Plan commitments. Therefore, a series of standardized equations will be provided, and states will fill in the relevant variable values (where data are lacking, states will make their best estimates of equation variables) to satisfy the valuing problem in the interim. States may also elect to use this approach for a long-term strategy after relevant studies identify the final form of these equations.

Each of these four valuing approaches would be used to estimate the value of (W), which is defined as the dollar value of a day in which one person participates in the activity in question.

After the dollar value of W (a user day) has been determined, it is then necessary to determine the dollar benefit (or cost) associated with the implementation of an AMP. States will use the dollar value of the user day as applicable to their selected course of action, i.e., applying user day values to either resulting demand changes or to changes in animal populations.

Example 1:

An example of using the dollar value of W; once determined, to assess the benefits of AMP implementation is assessed by the impact on wildlife population follows:

For the example, assume that use of the procedure outlined in enclosure 1 indicates that within fifteen years after implementation of an AMP, there would be an increase in the elk population of 50 animals on a sustained annual basis.

The present value of the change in elk population resulting from the AMP will be computed using the following process where:

W = The estimate of the average total willingness to pay for an additional user day.

AV_W = The annual value attributable to increased production of a wildlife species (after the appropriate budgeting period).

DH = Days required to harvest one animal.

HR = The harvest rate or percent of the animal population harvested in one year.

C = Change (+ or -) in the annual population which results for AMP implementation.

PV_W = The present value of the annual average value attributable to the change in wildlife population (given the 50 year analysis period and the relevant buildup factor).

BF = The appropriate buildup factor (15 years in this example) for the 50 year analysis period, using the mandated discount rate (presently 6 5/8%).

Relationships in Equation Form

$AV_W = W \times DH \times HR \times C$ and $PV_W = AV_W \times BF$

For this example, the following values for the elements of the equations are given.

W = $71.00
DH = 26.88
HR = 40%
C = 50
BF = 9.70

AVw = $71.00 x 26.88 x .40 x 50 = $38,169.60

PVw = $38,169.60 x 9.70 = $370,245.12

Example 2

An example using a demand analysis approach which indicates that implementation of the AMP will have a discernable impact on user demand for the resource as follows.

For elk sportsmen related use:

W = $71.00

D = Change in user days occuring on an annual basis after the appropriate buildup period (+ or -)

AV_D = The annual value atrributable to changes on user days demanded which result from AMP implementation.

BF = Appropriate buildup factor (15 years in this example) for the 50 year analysis period using the mandated discount rate (presently 6 5/8%).

PV_D = The present value of the annual average value attributable to changes in user days resulting from the impact of AMP implementation on user demand.

Relationships in Equation Form

$AV_D = W \times D$ and $PV_D = AV_D \times BF$

For this example the following values for the elements of the equations are given.

W = $71.00
D = +125
BF = 9.70

AV_D = $71.00 x 125 = $8,875

PV_D = $8,875 x 9.70 = $86,087.50

1. Access (User) Fee Approach

This approach may be difficult to apply in Public Land States due to scattered and unverifiable access fee data. Also, it is acknowledged that is would understate the true value of access due to the availability of no-fee use areas. However, some states may find it a useful and a relatively inexpensive valuing method.

This approach will be based on surveys or studies of actual access fees paid by hunters or other recreational users. A fee for access may be paid on a daily or season basis. It should not include any payment for service (guide, lodging, food, etc.), since these expenditures typically track into secondary impacts which is not appropriate for inclusion in the B/C analysis. Where such payments are made, they must be netted out from combined access/service fees if they are to be used in determining the value of wildlife benefits.

An access fee is an actually paid market price for a wildlife related activity and since the experience must be worth at least this amount, indicates a minimum threshold of value. Thus, this value can safely be used in B/C analysis.

The access fee approach can be used where sufficient information exists on charges for access in the private sector.

Where significant quality differentials are observed between the fee experience and the general experience, these differences must be accounted for in the analysis.

When an access fee is paid with the expectation or possibility of harvesting more than one species of wildlife, it is necessary to account

for this in determining the value of a user day.

If the experience for which access is charged is of about the same quality as the general user experience within a state, days required to harvest an animal or average daily bag will be obtained from the State wildlife agency to derive the value of a species population changes from the value of user days.

2. Willingness-to-pay survey approach

Willingness-to-pay is defined as including entry and use fees actually paid and also an estimate of the maximum amount in excess of these changes that users could be induced to pay. The payments include only site use compensation (no food, equipment, etc.). Use of this approach will require one or more survey questionnaires that must be administered by State Office personnel.

This approach estimates willingness-to-pay based on questionnaire responses from a sample of participants in the activity for which dollar value measurement is desired.

An initial questionnaire is used to identify a model in equation form. The initial survey is conducted in such a way as to obtain relevant information on variables which have an influence on the amount a person would be willing to pay in addition to what he/she is already paying for one additional user day.

The data gathered on what a person would be willing to pay additionally and the information on the variables involved is subjected to regression analysis to determine the relative influence of the various variables on a person's willingness-to-pay for the user day in question.

Another survey may be necessary after the initial survey which identifies the model to determine the values of the variables studied for the entire user population. However, it is possible that this information is available from secondary sources, in which case only the initial survey would be necessary. Any use of surveys would require the usual OMB clearance and should be compacted with considerable care so as to receive highly usable respondent results.

States using this method will model their approach after example studies, and the process explanation contained in Enclosure 2, Improved Procedures for Valuation of the Contribution of Recreation to National Economics Development , Water Resources Council Research Report No. 128, pp. 33 to 77. (States should consider the conditions laid down on pp. 138 - 140 to aid in deciding between this method and the travel cost method.)

3. Travel Cost Approach

This approach estimates the willingness-to-pay for a particular user day based on the actual behavior of participants. It may have application to a particular situation and should be chosen when it meets certain criteria outlined on pages 137-140 of enclosure 2.

States choosing an application of this method will use the procedures outlined in Enclosure 2 on pages 40-54 and 79-132 as an example. Once the value per user day is determined using this method, that value can then be used to estimate the present value of dollar benefits resulting from AMP implementation.

4. Short-term Standardized Equations

Following are the equations which will be used with this approach to

value big game species. States would provide their best estimates of the input variables. These interim equations for current use were derived by reviewing other studies with respect to important variables for inclusion in the equations as well as their estimated relative importance. The equations were also weighted to account for the relative worth of big-game species to sportsmen as demonstrated by efforts and resources expended to acquire them.

Work presently underway in the Departmen of Interior is designed to aid in the preparation of a set of long term standardized equations. This work is expected to add information about the relative importance of the species as well as the values of coefficients for the variables.

a) Big Horn Sheep

$$W = 100 + 2.3\ Y + 2\ A + 025\ T + .3\ S + 2.5\ D$$

b) Elk

$$W = 3 + 2.3\ Y + 2\ A + 025\ T + .3\ S + 2.5\ D$$

c) Deer

$$W = -25 + 2.3\ Y + 2\ A + .025\ T + .3\ S + 2.5\ D$$

d) Antelope

$$W = -26 + 2.3\ Y + 2\ A + .025\ T + .3\ S + 2.5\ D$$

Where

W = Average total willingness-to-pay for an additional hunter day

Y = Average disposable household income of activity participants expressed in thousands of dollars

A = Average years hunted in the region or State

T = Average one-way distance traveled to the activity site expressed in miles

S = Average success ratios over past five years expressed in percent x 100 (.20 x 100 = 20). The ratios must be for the same type of hunt presently being conducted.

D = Average number of days spent at the hunting site per trip.

Much of the required formulae input data should be available from state wildlife agencies or local study sources. Input data will be documented. Where existing data are lacking, best estimates will have to be made to determine the value of input variables.

An example of use of such a formula to estimate the value of a user day for deer follows.

This example demonstrates how the value of (W) is determined by considering influences of the variables of that value. For example, Y = 12 and the coefficient 2.3 tells us how much the level of income will affect what people would be willing to pay for the experience in question. The combination of the variable (Y) and the coefficient (2.3) explains that for every thousand dollars of average dispersable household income, there will be a $2.30 average effect on the willingness of people to pay for the user day. Another example of variable influence on willingness to pay is S = 31.33 and the coefficient is .3. This relationship of the coefficient (.3) and the variable 31.33 explains that for every ten percent increment in the success ratio, there will be a $3 effect on the average amount people would be willing to pay for the user day.

$W = -20 + 2.3\ Y + 2\ A + .025\ T + .3\ S + 2.5\ D$

Where $Y = 12$

$A = 7$

$T = 350$

$S = 31.33$

$D = 3$

$W = -25 + 27.60 + 14 + 8.75 + 9.40 + 7.50$

$W = \$42.25$

The following user day dollar values will be used by states for computing other than big game wildlife use and generalization of wildlife oriented recreation use. The values will apply uniformly to all states.

As with the big game example, these values are for use on as interim basis and will be updated as appropriate. States have the option to pursue valuing endeavors within the framework of the methods outlined in this document should they desire to develop their own values.

Activity	Value per user day
Sea-run freshwater fishing (salmon, steelhead, etc.)	$ 36
Other freshwater fishing	15
Waterfowl hunting	33
Small game hunting	20
Ordinary recreation day, other than hunting and fishing (rockhounding, sightseeing, etc.)	8

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